

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of)	
)	
Spectrum Task Force Requests Information on)	ET Docket No. 10-123
Frequency Bands Identified by NTIA as Potential)	
Broadband Spectrum)	

COMMENTS OF SHARED SPECTRUM COMPANY

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I. INTRODUCTION

Shared Spectrum Company (“SSC”) respectfully submits these comments in response to the *Public Notice*¹ in which the Commission’s Spectrum Task Force seeks comment on how the Commission can best promote wireless broadband deployment in the Federal government spectrum bands recently identified by the National Telecommunications and Information Administration (“NTIA”) for potential deployment of new wireless broadband systems. These Federal bands that have been or will be assessed by NTIA include the 1675-1710 MHz, 1755-1850 MHz, 3500-3650 MHz, 4200-4220 MHz, 4380-4400 MHz, 1670-1675 MHz, and 2385-2390 MHz bands.²

SSC’s recent comments and reply comments in ET Docket No. 10-237 suggested that these Federal bands are very suitable candidates in which to deploy Dynamic Spectrum Access (“DSA”)

¹ Office of Engineering and Technology and Wireless Telecommunications Bureau, “Spectrum Task Force Requests Information on Frequency Bands Identified by NTIA as Potential Broadband Spectrum,” *Public Notice*, ET Docket No. 10-123, DA No. 11-444 (Mar. 8, 2010) (“*Spectrum Task Force Public Notice*”).

² See U.S. Dept. of Commerce, “An Assessment of the Near-Term Viability of Accommodating Wireless Broadband Systems in the 1675-1710 MHz, 1755-1780 MHz, 3500-3650 MHz, and 4200-4220 MHz, 4380-4400 MHz Bands” (October 2010) (“Fast Track Report”), available at http://www.ntia.doc.gov/reports/2010/FastTrackEvaluation_11152010.pdf; U.S. Dept. of Commerce, “Plan and Timetable to Make Available 500 Megahertz of Spectrum for Wireless Broadband” (October 2010) (“Ten-year Plan”), available at http://www.ntia.doc.gov/reports/2010/TenYearPlan_11152010.pdf. See also U.S. Dept. of Commerce, “First Interim Progress Report on the Ten Year Plan and Timetable,” (April 4, 2011) (“Progress Report”), available at http://www.ntia.doc.gov/reports/2011/First_Interim_Progress_Report_04012011.pdf.

technologies to enable new broadband wireless services on a shared basis.³ Several other commenters in the *DSA NOI* proceeding also identified these and other Federal government bands for sharing with DSA and cognitive radio technologies.⁴ Although NTIA stated that it has not had an opportunity to analyze “new sharing methods” such as DSA in its assessment of potential broadband spectrum,⁵ SSC is encouraged by the *Spectrum Task Force Public Notice*, which seeks specific comments on, among other issues, alternatives to exclusion zones and relocation of incumbents. We strongly agree that DSA technology will enable broadband wireless systems to operate “more efficiently on a co-channel, co-coverage basis” in peaceful coexistence with incumbent Federal satellite, radar and other operations using “time sharing” and other techniques.⁶

The Commission’s proactive efforts in the *DSA NOI* and other proceedings, together with the Obama Administration’s initiatives to promote “innovative spectrum-sharing technologies,”⁷ will not only help accelerate the spectrum “reallocation” process but will foster innovation, create new jobs and businesses, enable affordable service in rural areas, improve public safety and lead to the other benefits broadband brings. Accordingly, SSC encourages the Commission to immediately commence a rulemaking proceeding that proposes allocation and service rules for new, DSA-enabled wireless

³ See “Promoting More Efficient Use of Spectrum Through Dynamic Spectrum Use Technologies,” *Notice of Inquiry*, ET Docket No. 10-237, 25 FCC Rcd 13711 (Nov. 30, 2010) (“*DSA NOI*”); SSC Comments in ET Docket No. 10-237 at 22-23, available at <http://fjallfoss.fcc.gov/ecfs/document/view?id=7021032291>; SSC Reply Comments in ET Docket No. 10-237 at 12-13, available at <http://fjallfoss.fcc.gov/ecfs/document/view?id=7021235636>.

⁴ See AT&T Reply Comments in ET Docket No. 10-237 at 8-9; Grunwald Comments in ET Docket No. 10-237 at 7; AT&T Comments in ET Docket No. 10-237 at 5; Public Interest Spectrum Coalition Comments in ET Docket No. 10-237 at 28-32; T-Mobile Comments ET Docket No. 10-237 at 6-9.

⁵ Fast Track Report at 1-4 n. 8, 2-1, 2-8, 4-1.

⁶ *Spectrum Task Force Public Notice* at 2, 4.

⁷ See White House Fact Sheet, “President Obama’s Plan to Win the Future through the Wireless Innovation and Infrastructure Initiative” (Feb. 10, 2010), available at <http://www.whitehouse.gov/the-press-office/2011/02/10/president-obama-details-plan-win-future-through-expanded-wireless-access>), Memorandum for the Heads of Executive Departments and Agencies, “Unleashing the Wireless Broadband Revolution,” released June 28, 2010, 75 Fed. Reg. 38387, 38388 Sec. 3 (July 1, 2010) (“Presidential Memorandum”), available at <http://www.whitehouse.gov/the-press-office/presidential-memorandum-unleashing-wireless-broadband-revolution>.

broadband services in a variety of Federal spectrum bands. As set forth below, this rulemaking should propose a flexible spectrum access framework that includes DSA-enabled sharing with Federal incumbents utilizing a number of effective sharing techniques that are tailored to the particular band and sharing scenarios. Such a framework would focus on “multi-purposing” the Federal (and non-Federal) bands with flexible overlay rights and measured responsibilities to safeguard incumbent operations. On the other hand, if the Commission pursues the traditional path of “repurposing” of these bands that involves relocating all or most Federal incumbents, this would be difficult, costly, time consuming, inefficient and, in light of new and emerging technology, unnecessary.⁸

In these comments, SSC builds upon its previous recommendations to the Commission in the *DSA NOI* proceeding to (1) develop a “policy-based” regulatory framework for DSA across multiple spectrum bands and (2) propose spectrum sharing rules for Federal spectrum bands that take into account incumbent requirements and incentives. We also describe an alternative to the massive exclusion zones that NTIA has proposed for the 3.5 GHz band.

II. SSC’S RECOMMENDATIONS

In the *Spectrum Task Force Public Notice*, the staff seeks comment on several issues relating to whether and to what extent the Federal bands identified could be made available for broadband deployment, including NTIA’s technical assumptions, the proposed conditions that would be placed on the bands (*e.g.*, exclusion zones), and effective spectrum sharing techniques (*e.g.*, coordination in time, geography, or policy, and/or the use of cognitive technologies).⁹ The Spectrum Task Force also requests

⁸ See, *e.g.*, *DSA NOI* at ¶¶ 43-44 (“[While] traditional sharing techniques based on geographic separation or frequency coordination may yield the highest valued use of the spectrum . . . relocation of existing services to other spectrum may not always be feasible and traditional sharing techniques may not make the most efficient use of the spectrum, particularly for services that do not operate continuously, leaving the spectrum available for others to use part of the time.”)

⁹ *Spectrum Task Force Public Notice* at 2.

specific comments related to the particular bands of interest.¹⁰ For example, with regard to the exclusion zones that NTIA has recommended for the 3.5 GHz band along the coasts, the Spectrum Task Force noted that “there will be periods when the radars are not operating” and invited comment “as to whether there are techniques that can be developed to enable co-existence with the ship-borne radars, such as dynamic spectrum access, to avoid use of this spectrum when interference is present and instead move communications traffic to other spectrum.”¹¹ The answer to this important question is, “yes,” and below we outline the regulatory steps that should be taken to enable such capabilities within a reasonable timeframe.

A. The Commission Should Consider Innovative, DSA-enabled Sharing Approaches in Reallocating the Federal Spectrum Bands Under Consideration

In response to the comments filed in the *DSA NOI*, SSC agrees with several commenters’ assertions that intermittently used or geographically focused Federal government spectrum bands are strong candidates for sharing through DSA technologies. We also agree that “[t]apping into this federal spectrum will be an essential component to identifying additional spectrum resources for both licensed and unlicensed broadband operations.”¹² Therefore, the Commission should consider innovative, DSA-

¹⁰ NTIA’s Office of Spectrum Management (“OSM”) has also recently raised important questions and technical issues to assess the electromagnetic compatibility between DSA-enabled devices and incumbent spectrum users. *See* Letter from Associate Administrator, Office of Spectrum Management, to Chief, Office of Engineering and Technology (March 3, 2011) (“[NTIA] supports the goal of the [*DSA NOI*] to investigate dynamic spectrum access technologies and techniques that have the potential to enable more efficient utilization of our nation’s spectrum resources.”) The issues raised by OSM primarily relate to potential “interference scenarios,” as well as deterministic and probabilistic “analysis methodologies” on which SSC is working for several military customers under Federal Government contracts. Additional information on these projects will be made available to NTIA and Commission staff pursuant to the applicable security and disclosure restrictions and procedures. The views, opinions, and/or findings contained in these comments are those of the authors and should not be interpreted as representing the official policies, either expressed or implied, of the Defense Advanced Research Projects Agency or the United States Department of Defense.

¹¹ *Spectrum Task Force Public Notice* at 3.

¹² AT&T Reply Comments in ET Docket No. 10-237 at 8 (“Further efforts in experimenting with and deploying dynamic spectrum access should be focused on federal spectrum holdings. . . . The Commission should continue to work with NTIA and others to identify spectrum that can be repurposed for mobile broadband and to explore how (continued....)”)

enabled sharing approaches in reallocating the Federal spectrum bands under consideration in this proceeding.

With regard to the two particular bands that were identified for immediate reallocation in its Fast Track Report (1695-1710 MHz and 3550-3650 MHz), NTIA has recommended that the Commission “take the necessary regulatory actions” to make this spectrum available for wireless broadband on a “shared” basis with currently allocated Federal services.¹³ According to NTIA, “sharing these bands will require geographic limitations on wireless broadband operations to make them available within the next five years and to ensure that there is no loss of critical existing and planned Federal Government capabilities.”¹⁴ Although its sharing analysis is comprehensive, the Fast Track Report relied solely on a geographic exclusion zone approach and did not consider advanced technologies or “other sharing approaches” because NTIA’s “deadline” did not “leave time to test and prove new sharing methods.”¹⁵

Other than time constraints, it is unclear, from NTIA’s perspective, why other “proven” or previously approved spectrum sharing approaches, including geographic coordination, dynamic frequency selection (“DFS”) or geolocation databases were not evaluated. NTIA’s Ten-Year Plan anticipates “detailed analysis” of “the technical feasibility of sharing spectrum (both among Federal users and between Federal and non-Federal users) using geographic separation and temporal sharing within the incumbent band.”¹⁶ However, NTIA has announced that its “detailed evaluation” of the 1755-1850 MHz will also be done quickly (by September 30, 2011) and that it has already “developed a set of spectrum for

(Continued from previous page) _____

dynamic spectrum access can help maximize the use of federal spectrum resources in times of lower federal demand. Dynamic spectrum access techniques could make possible innovative methods of time- or geographic-based sharing that will allow licensed or unlicensed uses to proliferate in bands that must continue to accommodate important federal operations.”)

¹³ Letter from Associate Administrator, Office of Spectrum Management, NTIA, to Chief, Office of Engineering and Technology, FCC (Jan. 19, 2011), *available at* http://www.ntia.doc.gov/filings/2011/NTIA_FCC_Letter_115%20MHz_01192011.pdf.

¹⁴ *Id.*

¹⁵ Fast Track Report at 1-4 n.8, 2-1.

¹⁶ Ten-Year Plan at 12.

potential comparable spectrum for relocation,”¹⁷ suggesting that more intensive sharing of this band could be off the table as well. Nevertheless, we assume that, at least from the Commission’s perspective in light of some of the questions posed in the *Spectrum Task Force Public Notice*, alternative sharing approaches that enable broadband wireless systems to operate “more efficiently on a co-channel, co-coverage basis” are still on the table for the two “Fast Track” bands as well as other Federal bands, including the 1755-1850 MHz Band.¹⁸

In light of this assumption and the strong encouragement in the Public Notice to provide supporting technical information on geographic and time sharing techniques, below we build upon our previous recommendations in the *DSA NOI* proceeding that the Commission develop a “policy-based” regulatory framework for DSA and propose particular spectrum sharing rules for Federal spectrum bands. We also provide an example of an alternative to the huge exclusion zones that NTIA has proposed for the 3.5 GHz band. If, however, DSA-based sharing approaches using cognitive radio and other newer technologies are not going to be considered by the Commission for the Fast Track and other Federal bands, that would be a major setback for technical innovation and would be contrary to express statements of Administration and Congressional policy. Moreover, not only would significant portions of the U.S. population in the proposed exclusion zones remain unserved, but the value of the spectrum would be substantially lower.¹⁹

Further disregard of modern sharing approaches would be extremely surprising in light of the fact that NTIA has endorsed DSA and has been testing DSA-enabled cognitive radio systems at its Boulder Labs since March 2009. Well before phase I of the NTIA test-bed program started, NTIA modified its

¹⁷ Progress Report at 4.

¹⁸ *Spectrum Task Force Public Notice* at 2, 4.

¹⁹ See C. Bazelon, “The Economic Basis of Spectrum Value: Pairing AWS-3 with the 1755 MHz Band is More Valuable than Pairing it with Frequencies from the 1690 MHz Band,” at 12-13, 22 (Apr. 11, 2011), filed ET Docket No. 10-123.

federal frequency management regulations to enable Federal government systems to use cognitive radio technologies.²⁰ Several other NTIA documents, including speeches and reports, endorse DSA.²¹ Similarly, the Commission provided three examples in the *DSA NOI* where it has adopted rules to implement dynamic spectrum use to enable access to unused spectrum while avoiding interference to other users.²² Two of these examples include spectrum shared with Federal users.

More recently, President Obama recognized that the Federal government can “unlock the value of otherwise underutilized spectrum and open new avenues for spectrum users to derive value through the development of advanced, situation-aware spectrum-sharing technologies.”²³ The President’s memo states that, in their quest for 500 MHz of Federal and nonfederal spectrum over the next ten years, NTIA and the Commission will make some of this spectrum “available for shared access by commercial and Government users.”²⁴ Despite its identification of compelling “themes” such as the development of “new tools” and “new incentives” to free up spectrum while ensuring “sound government performance and effective use of its spectrum, pushing for effective repurposing, sharing,

²⁰ In Sept. 2008, NTIA made modifications to the NTIA Manual to add a definition of Cognitive Radio and added a new section 8.4 in Chapter 8 (Procedures and Principles for the Assignment and Coordination of Frequencies). See NTIA, Manual of Regulations and Procedures for Federal Radio Frequency Management (January 2008 Edition, May 2010 Revision), available at <http://www.ntia.doc.gov/osmhome/redbook/6.pdf> and <http://www.ntia.doc.gov/osmhome/redbook/8.pdf>.

²¹ See, e.g., Letter from Assistant Secretary for Communications and Information, NTIA, to Chairman, Federal Communications Commission, et al, GN Docket No. 09-51 at 5 n.23 (Jan. 4, 2010), available at http://www.ntia.doc.gov/filings/2009/FCCLetter_Docket09-51_20100104.pdf; Remarks of Assistant Secretary of Commerce, Lawrence E. Strickling, 2009 DOD Spectrum Symposium (Arlington, VA, Oct. 14, 2009) (as prepared for delivery), available at http://www.ntia.doc.gov/speeches/2009/LS_DODSpectrumSymposium_10142009.html; NTIA, Federal Strategic Spectrum Plan at 3, 9 (March 2008), available at <http://www.ntia.doc.gov/reports/2008/FederalStrategicSpectrumPlan2008.pdf>; Commerce Spectrum Management Advisory Committee, “Final Report of the Interference and Dynamic Spectrum Access Subcommittee” at 7 (Jan. 11, 2011), available at http://www.ntia.doc.gov/advisory/spectrum/reports/CSMAC_InterferenceCommitteeReport_01102011.pdf.

²² See *DSA NOI* at ¶ 4.

²³ See Presidential Memorandum at 38387.

²⁴ *Id.* at 38388.

and innovative uses of spectrum wherever possible,”²⁵ NTIA’s analysis and plans unfortunately suggest that these goals, as they relate to sharing and innovative uses of Federal spectrum, are longer-term objectives.

Congress has also sent a clear message to the FCC and NTIA that they “should also consider dynamic sharing involving so-called ‘smart’ sensing devices, or devices that are able to access real-time spectrum monitoring databases” when recommending spectrum frequencies to be reallocated or otherwise made available for “shared access.”²⁶ The House Committee on Energy and Commerce has recognized that “[t]he emergence of spectrum sensing and sharing technologies, including wireless devices or systems that are more aware of their radio environment through real-time spectrum monitoring measurements or access to databases, are beginning to enable more dynamic forms of shared access for spectrum.”²⁷ However, as the General Accountability Office has recognized, “[t]he current structure and management of spectrum use in the United States does not encourage the development and use of some spectrum efficient technologies [such as] software-defined cognitive radios—radios that adapt their use of the spectrum to the real-time conditions of their operating environments”²⁸

A new Commission rulemaking proceeding that goes beyond NTIA’s “exclusion zone” recommendations and other leanings toward incumbent relocation would go a long way in promoting innovation. This rulemaking should specifically propose a new “policy-based” regulatory framework for DSA-enabled sharing in the Fast Track and other Federal bands and rules that take into full account the interference and operational requirements of Federal incumbents.

²⁵ Ten-Year Plan at 2.

²⁶ Committee on Energy and Commerce, U.S. House of Representatives, “Report to Accompany H.R. 3125, The Radio Spectrum Inventory Act,” H.R. Rep. No. 462, 111th Cong., 2d. Sess. at 11 (Apr. 13, 2010).

²⁷ *Id.*

²⁸ General Accountability Office, “Spectrum Management: Better Knowledge Needed to Take Advantage of Technologies That May Improve Spectrum Efficiency,” GAO-04-666 at 3 (May 28, 2004).

B. The Commission Should Propose a Policy-Based Regulatory Framework for DSA-Enabled Sharing in Federal Government Bands

In response to the *DSA NOI*, SSC explained how policy-controlled devices meeting specified reconfigurability requirements could enable both “cooperative” and “opportunistic” access across a wide swath of spectrum bands, including Federal spectrum.²⁹ The Commission would require eligible RF devices to be reconfigurable by establishing minimum hardware and software capabilities for such devices to implement necessary interference avoidance measures. These measures would include baseline operating parameters (mirroring technical rules for non-DSA-enabled devices) as well as DSA features such as sensing, geo-location database lookups and/or beacons, but deviation from the baseline parameters would only be authorized through secure policy controls managed, for example, by trusted third-party band managers. The Commission’s rules could also include a built-in enforcement apparatus to implement interference deconfliction remedies “to control and modify the devices to address potential problems or changed conditions.”³⁰ This approach would enable the Commission, NTIA and Federal agencies to require and be assured that DSA-enabled radios stop operating on particular frequencies if their operational protocols are not validated or updated within a specified time frame.

Such measures would then enable a Federal incumbent to quickly reclaim use of its spectrum

²⁹ See SSC Comments in ET Docket No. 10-237 at 20-21; *see also* SSC Reply Comments at 6. While the Commission could, as suggested in SSC’s comments, initiate a policy-based framework approach in a new Policy Statement that would guide future band-specific rulemakings, we suggest that a Notice of Proposed Rulemaking focusing on the Federal bands could also be issued instead of or simultaneously with such a Policy Statement, which is consistent with prior Commission practice. *See, e.g.*, “Principles for Reallocation of Spectrum to Encourage the Development of Telecommunications Technologies for the New Millennium,” *Policy Statement*, FCC 99-354, 14 FCC Rcd 19,868 (rel. Nov. 22, 1999) and *see generally* “Amendment of the Commission’s Rules with Regard to the 3650-3700 MHz Government Transfer Band,” ET Docket No. 98-237, and “The 4.9 GHz Band Transferred from Federal Government Use,” ET Docket No. 00-32. The 4.9 GHz Band Transferred from Federal Government Use,” *Notice of Proposed Rule Making* in WT Docket No. 00-32, 15 FCC Rcd 4778 (rel. 2000). *See also* “Principles for Promoting Efficient Use of Spectrum By Encouraging the Development of Secondary Markets,” *Policy Statement*, FCC 00-401, 15 FCC Rcd 24178 (rel. Dec. 1, 2000) and “Promoting Efficient Use of Spectrum Through Elimination of Barriers to the Development of Secondary Markets,” *Notice of Proposed Rulemaking* in WT Docket No. 00-230, 15 FCC Rcd 24203 (rel. Nov. 27, 2000).

³⁰ T-Mobile Comments in ET Docket No. 10-237 at 9.

when needed for a particular operation, exercise or emergency or when harmful interference occurs. This avoids the problems experienced many times where interfering devices (*e.g.*, garage door openers, radar detectors, signal boosters) are deployed in the market and there is no effective way to remove them completely.³¹ These policy-controlled, DSA-enabled devices would therefore *not* be allowed *nor* able to operate “autonomously.” Moreover, the rules would anticipate and address security risks that are inherent in any software configurable RF device to ensure that operating parameters always remain within the authorized limits.

SSC has designed its policy-controlled, DSA-enabled wireless systems to be substantially more secure and resilient than any existing non-DSA devices. We provide strong user authentication, policy encryption, secure local and remote policy repositories, configuration management, and logging device activity.³² In addition to the typical labeling and marketing regulations to provide consumers with clear information about legal uses of their DSA-enabled devices,³³ the Commission’s proposed rules could go further to include these and other integrated authentication and security requirements if necessary to safeguard especially sensitive Federal operations in shared or adjacent bands. For example, the proposed rules could also require an approach that further “partitions” the security element that prevents tampering or misuse from the policy provisioning, management, and updating functions.³⁴

This policy-based framework, like in similar sharing contexts, would require an adequate and

³¹See CTIA Reply Comments in ET Docket No. 10-237 at 14.

³² See SSC Reply Comments at 18, citing R. Foster, P. Tenhula, M. McHenry, and F. Perich, “Cognitive Radio Access for Public Safety,” SDR ‘09 Technical Conference (Dec. 2009), *available at* <http://groups.winnforum.org/d/do/2445>. SSC also uses a policy certificate security management feature that is managed only by authorized stakeholders through a set of the policy authoring, validation and administration tools. The tools are only accessible with a secure user name and password that must correspond to the encrypted certificate used to sign each message and policy transmitted to or from DSA-enabled devices. *Id.*

³³ See, *e.g.*, “Amendment of Parts 1, 2, 22, 24, 27, 90 and 95 of the Commission’s Rules to Improve Wireless Coverage Through the Use of Signal Boosters,” *Notice of Proposed Rulemaking* in WT Docket No. 10-4, FCC 11-53 at ¶¶ 42-45 (April 6, 2011).

³⁴ See InterDigital Reply Comments in ET Docket No. 10-237 at 5.

efficient compliance testing and measurement regime for device certification.³⁵ This process does not need to be overly complex for testing reconfigurable DSA-enabled radios so long as basic reconfigurability and policy-control requirements are tested and certified. There are a multitude of potential sharing and interference scenarios across the various Federal bands and each scenario is likely to have hundreds of potentially important technical factors. Many of these factors and their variables will not be well known even at deployment time (and thereafter). And, they span a wide range of areas on both the incumbent and the DSA sides of the analysis such as actual and potential usage characteristics, propagation issues, equipment and antenna designs, and waveforms.

As the Commission launches a new proceeding on sharing these Federal bands, it should focus on the technical performance criteria and information that are the most critical to the spectrum sharing issues applicable to these particular bands and consider the test and measurement procedures for such issues at the same time. For example, in developing new procedures for sensing-based DSA-enabled transceivers, the Commission should make every effort to ensure that the test signals used in the compliance measurements accurately represent most protected signals employed in the applicable bands, but it should also recognize that all test signals may not be available or represent the real-world environment.

The Commission should also be cognizant of and strongly support the ongoing efforts to test and evaluate the capabilities and performance of policy-based DSA-enabled radio systems in the presence of various types of potential interference.³⁶ Although the Commission's compliance testing will represent a smaller subset of the broader performance evaluations being conducted, the Commission staff must have

³⁵ See, e.g., "Revision of Parts 2 and 15 of the Commission's Rules to Permit Unlicensed National Information Infrastructure Devices in the 5 GHz Band," *Report and Order* in ET Docket No. 03-122, 18 F.C.C. Rcd. 24484 (2003).

³⁶ See NTIA, Fiscal Year 2010 Progress Report, "Spectrum Sharing Innovation Test-Bed Pilot Program" (March 2011), available at http://www.ntia.doc.gov/frnotices/2006/spectrumshare/FY10_Test_Bed_Progress_Report_FinalCopy.DOC; see also, e.g., J. Boksiner, et. al, "Testing of Policy-Based Dynamic Spectrum Access Radios," in proceedings of 2010 IEEE Military Communications Conference (MILCOM 2010) pp.773-778 (Oct. 2010), available at <http://cs.itd.nrl.navy.mil/pubs/docs/MILCOM2010-5524.pdf>.

early and frequent input into the development of these testing frameworks and plans to ensure that they do not cause undue delay or effectively quash innovation and deployment of DSA-enabled wireless broadband systems in shared Federal bands. Such frameworks and plans should be flexible and focus on tests that accurately characterize and evaluate the interference-avoidance capabilities and policy execution of DSA-enabled systems, such as the time it takes to abandon a channel, in the relevant electromagnetic environment.

C. The Commission Should Propose Sharing Rules for Federal Spectrum Bands that Take into Account Incumbent Requirements and Incentives While Providing Significant Opportunities for Broadband Wireless Deployment

The Spectrum Task Force noted in the *Public Notice* that the large exclusion zones along the coasts were proposed for the 3550-3650 MHz band “due to potential interference from federal ship-borne radars to commercial mobile systems.”³⁷ The Spectrum Task Force sought comment on whether this proposed approach and NTIA’s analyses are appropriate for next generation broadband systems and whether potential commercial users would be able to take steps to operate with smaller exclusion zones, willing to accept the increased interference risks with smaller or no exclusion zones and, if so, how increased interference risks could be addressed in the Commission’s rules. It also invited comment on other techniques that can enable co-existence with the ship-borne radars, such as DSA.³⁸

In our filings in the *DSA NOI* proceeding, SSC urged the Commission to propose a range of sharing conditions and service rules that are necessary to protect Federal systems, including several “incumbent-friendly” features and requirements that can be implemented with DSA solutions.³⁹ These

³⁷ *Spectrum Task Force Public Notice* at 3.

³⁸ *Id.*

³⁹ SSC Comments in ET Docket No. 10-237 at 23-24.

include measures that (a) enable Federal incumbents to change their radio equipment or operating parameters; (b) require new DSA-enabled systems to have one or more backup spectrum bands and prohibit operations solely within a protected Federal band; (c) provide Federal incumbents (or the Commission and NTIA) the capability to easily identify sources of harmful interference and/or quickly correct problems through other means; (d) require DSA system to have a policy certificate management feature that prevents unauthorized or accidental access to restricted frequencies or geographic areas; and (e) give Federal agencies greater flexibility to be reimbursed for spectrum sharing or leasing arrangements.

These proposed measures, if implemented through DSA-enabled wireless broadband systems, would provide the same protection for Federal radar and satellite systems as, if not more than, the proposed exclusion zone approach. At the same time they would add significant value to the spectrum bands by providing significantly more access to broadband consumers who would otherwise be in restrictive exclusion zones or have less bandwidth, especially in the 3.5 GHz band. We propose an alternative concept that would enable access to more valuable, but underutilized Federal spectrum on a shared basis.

If there are exclusion zones in the 3.5 GHz band (or other Federal bands), they need to be based primarily on interference to the Federal systems by the new wireless broadband systems, not on the potential interference to the new systems from the Federal systems. Such zones could build upon the Commission's experience in protecting Federal operations in the 1710-1755 MHz Advanced Wireless Services ("AWS") band. Specifically, Section 27.1134 of the Commission's rules⁴⁰ requires AWS licensees in the 1710–1755 MHz band to protect Department of Defense ("DoD") communications

⁴⁰ 47 CFR § 27.1134.

systems at 16 protected facilities across the U.S.⁴¹ AWS licensees must accept any interference received from these facilities. They must also protect the DoD facilities from interference by restricting or coordinating their operations within the specified radii of Federal operations (*i.e.*, exclusion zones and coordination zones).⁴² Other “lessons learned” from prior sharing situations and problems could also be implemented to make sure that the new and existing spectrum usage rights are clear and enforceable.

Like with AWS, new wireless broadband systems (“WBS”) could be subject to only minimally necessary, but more flexible exclusion zones, which could similarly be surrounded by “coordination” or other types of zones depending on the WBS providers’ technical capabilities to avoid both causing harmful interference to incumbent Federal systems and receiving harmful interference from incumbent operations. For example, WBS operators using more advanced interference avoidance technologies (“AWBS”) such as DFS and DSA to select frequencies could gain access to more spectrum geography and, therefore, consumers. Based on this concept, up to four different zones could be specified such as the following:

1. The “Impact Zone” would be the largest potential geographic area in which the WBS must accept harmful interference received from Federal incumbent’s facilities, which could vary based on Federal operations. If broadband systems are impacted by the incumbent system within this zone in some or most of the frequencies in the band, the WBS operators would be expected, but not required to employ interference mitigation technology to operate within this zone. WBS operators could arrange to receive mandatory advisory notices of Federal exercises or expansion of operations (permanent or temporary). An AWBS would be able to more rapidly and automatically detect the interference, determine its location in the zone and change its operating frequency to a “backup” band or frequency without losing connectivity.
2. The “WBS Exclusion Zone” would be the geographic area in which the incumbent Federal system (when and if it is operating in this area and on the same or adjacent

⁴¹ While DoD operations at 14 of the 16 facilities have been or will be relocated, operations at the Yuma, Arizona and Cherry Point, North Carolina facilities must be protected indefinitely. *Id.*

⁴² Outside of the “protection radii” are coordination zones in which AWS licensees must coordinate with the Commander of each facility. The two specified coordination distances depend on AWS transmitter power and antenna height. *Id.*

frequencies) is likely to experience harmful interference from WBS operations. Only advanced WBS systems would be authorized to operate in this Exclusion Zone without any mandatory coordination requirements. The regulations would mandate the equipment capabilities that can be deployed in this zone.

3. The “AWBS Exclusion Zone” would be where even AWBS operations are not permitted on or next to the same frequencies being used by the incumbent Federal systems in this area because the AWBS system will more than likely cause harmful interference to the protected Federal system. Voluntary coordination could be used to allow AWBS operations at certain times.

4. The “Occupied Zone” would be the geographic area in which the incumbent Federal system’s signal is so strong that all channels in the shared band are not likely usable by the WBS or AWBS system when a legacy system is operating. WBS operators could arrange to receive voluntary advisory notices of Federal exercises or expansion of operations (permanent or temporary).

A potential depiction of this four-zone concept in the 3.5 GHz band is shown in the figure below.

This concept could be implemented using an exclusive licensing approach for WBS and AWBS authorizations or, more likely and more quickly, by proposing a non-exclusive, “light-licensing” mechanism like in the neighboring 3650-3700 MHz band. However, the more flexible multi-zone approach could allow for higher power operations for AWBS users. SSC welcomes the opportunity to collaborate with Commission and NTIA staff to further develop this or other DSA-enabled sharing concepts.



III. CONCLUSION

SSC is pleased that the Commission continues to recognize that new technologies such as dynamic spectrum access and cognitive radios enable more efficient use of existing Federal spectrum allocations and can create new opportunities for sharing Federal spectrum bands with new broadband wireless services. We again urge the Commission to move quickly to implement the proposals above in a rulemaking proceeding.

Respectfully submitted,

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